AT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:
THOMAS J. SONDERMAN
SCOTT BUSHMAN
CRAIG WILLIAM CHRISTIAN

Serial No.: 09/880,975

Filed: JUNE 13, 2001

For: METHOD AND APPARATUS FOR CONTROLLING A THICKNESS OF A COPPER FILM

Group Art Unit: 2813

Examiner: E. KIELIN

Conf. No.: 5882

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CUSTOMER NO.: 23720

REPLY BRIEF TO EXAMINER'S ANSWER DATED APRIL 28, 2006

CERTIFICATE OF MAILING UNDER 37 C.F.R. § 1.8	
DATE OF DEPOSIT:	June 28, 2006

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Sir:

Appellants hereby submit this Reply Brief to the Board of Patent Appeals and Interferences in response to the Examiner's Answer dated April 28, 2006.

Originally, a Notice of Appeal for the above-captioned application was filed on December 29, 2004 (in response to a Final Office Action dated October 25, 2004). Subsequently, an Appeal Brief was filed on February 28, 2005. The Examiner subsequently re-opened prosecution in the Final Office Action dated June 8, 2005. The shortened, three-month statutory date for response to the Final Office Action dated June 8, 2005 was September 8, 2005. In response to the Final Office Action dated June 8, 2005, Appellants exercised their option to Maintain Appeal in a Reply Brief filed on September 8, 2008. Subsequently, the Examiner

issued an Office Communication dated December 5, 2005 (three days before the statutory six-month date from the Final Office Action dated June 8, 2005), raising further objections. In response, Appellants filed a Response to Final Office Action on December 8, 2005 to respond to Examiner's objections in the Office Communication dated December 5, 2005. Subsequently, the Examiner seems to have entered the Appeal Brief, the Reply Brief filed on September 8, 2005 and issued an Examiner's Answer on April 28, 2006. In response to the Examiner's Answer, Appellants hereby file this Reply Brief to Examiner's Answer. Appellants also hereby incorporate the previously filed Appeal Brief and the Reply Brief filed on September 8, 2005, in their entirety.

The two-month date from the Examiner's Answer dated is June 28, 2006. Therefore, this Reply Brief to Examiner's Answer is believed to be timely filed. However, if an extension of time is required to enable this paper to be timely filed and there is no separate Petition for Extension of Time filed herewith, this paper is to be construed as also constituting a Petition for Extension of Time for a period of time sufficient to enable this document to be timely filed.

No fee is believed due for filing this Reply Brief. However, should any fee under 37 C.F.R. §§ 1.16 to 1.21 be deemed necessary for any reason relating to this document, the Director is authorized to deduct said fees from Williams, Morgan & Amerson, P.C., Deposit Account No. 50-0786/2000.045300/TT3258.

ARGUMENT

As a background to the issue regarding Examiner's request for information, in the Final Office Action dated June 8, 2005 (mailed subsequent to the Appeal Brief filed by the Appellants), the Examiner provided a request for information under 37 C.R.F. 1.105. The Examiner requested all information available for the devices relating to Rudolph and Tencor originally cited as examples of metrology instruments. Although Appellants maintain that such information is moot in light of the amendments to the Specification that deleted references to these examples, Appellants responded to the Examiner's request. Pursuant to 37 C.F.R. 1.105(4)(b), Appellants provided all available information relating to the Rudolph metrology instrument. Further, information relating to the Tencor example is not known and/or is not readily available to Appellants. Therefore, pursuant to 37 C.F.R. 1.105(4), all requirements made by the Examiner under 37 C.F.R. 1.105 have been satisfied. Appellants respectfully assert that the information relating the Rudolph attached herewith does not affect Examination of the present application. This is particularly true since the Rudolph metrology instrument was merely listed as an example of a metrology tool that may be used by embodiments of the present invention. Since references to Rudolph and Tencor were deleted from the Specification, Examiner's request under 37 C.F.R. 1.105 relating to the deleted matter are moot and should be dismissed.

Further, Appellants respectfully assert that removals of the examples of metrology tools (Rudolph and Tencor) do not constitute new matter. The Examiner erred in asserting that removal of mere examples of metrology tools that could be used with embodiments of the present invention constitutes new art. Appellants respectfully assert that the removal of the

examples do not constitute removal of admitted prior art as asserted by the Examiner. Rudolph and Tencor were cited at examples of metrology tools that may be implemented with embodiments of the present invention. Appellants did not provide any assertions that would indicate an admission of prior art relating to the examples of the metrology tools (Rudolph and Tencor). Appellants respectfully assert that removal of the references to Rudolph and Tencor does not constitute new matter.

Appellants assert that the issue relating to Examiner's request under 37 C.F.R. 1.105 is moot as a result to the amendment to the Specification removing any references to Rudolph and Tencor. Deleting this section does not constitute adding new material to the specification. This requirement of information is now moot and Appellants respectfully request that the Examiner request be dismissed. Further for the convenience of the Office, Appellants have provided the Examiner with all available information relating to the request under 37 C.F.R. 1.105. However, Appellants maintain that such information is moot in light of the amendments to the specification that deleted any reference to these examples. The attached documents relating to the Rudolph example are "Operating Your MetaPULSE System" and "MetaPULSE Administrator's Guide". For at least the reasons provided below, these documents do not constitute new evidence. Further, information relating to the Tencor example is not known and/or is not readily available to Appellants. Therefore, pursuant to 37 C.F.R. 1.105(4), all requirements made by the Examiner under 37 C.F.R. 1.105 are satisfied. Appellants respectfully assert that the information relating the Rudolph attached herewith does not affect Examination of the present application. This is particularly true since the Rudolph metrology instruments was merely listed as an example of a metrology tool that may be used by embodiments of the present invention. Appellants respectfully assert that information relating to the Rudolph example of a metrology

tool does not affect the claims or Examiner's rejections. Hence Appellants respectfully ask that the Board dismiss Examiner's assertion that the removal of examples provided in the Specification constitutes new matter, and respectfully request that the Board move forward the Appeal process of the present application.

Additionally, Appellants respectfully assert that information relating to the Rudolph example is not new evidence since it was discussed and argued previously. Further, information relating to the Rudolph is not relevant to the allowability of the claims since this information merely refers to examples of metrology tools that may be used with embodiments of the present invention. Therefore, this information is not required to assess the merits of the arguments provided in this Appeal. Previously, Appellants had deleted the references to the Rudolph and Tencor examples from the Specification. This matter has been discussed in previous office actions and responses. Therefore, information relating to Rudolph does not constitute new evidence. Appellants respectfully request that the Board dismiss Examiner's request under 37 C.F.R. 1.105 and decide the case on the merits of the arguments provided herein. Appellants respectfully assert that the information relating to the Rudolph example is provided in the Evidence Appendix and it does not constitute new evidence for the reasons cited herein.

Contrary to Examiner's position in the Examiner's Answer, Appellants respectfully assert that the regional deletion of subject matter from the specification does not constitute new matter since the deleted subject matter merely refers to examples of a metrology tool and it does not affect the claims or the Examiner's rejections. Further, Appellants have provided to the Examiner all information relating to these examples that is available to the Appellants. Appellants have not provided any assertions that would have indicated an admission of prior art

relating to the examples of the metrology tools of Ritzdorf and Tencor. Therefore, the Examiner's arguments that admissions of prior art is being removed does not apply since no new matter was added by the deletion of these examples. Clearly, this issue is an appealable issue that can be decided by the Board of Appeals.

Regarding the merits of Examiner's rejections of the claims, the Examiner has pieced together various prior art (*i.e.,* U.S. Patent No. 6,428,673 (***Ritzdorf***), U.S. Patent No. 6,221,765 (***Ueno***) and U.S. Patent No. 6,298,470 (***Brenier***) to place forward piecemeal-type arguments to assert obviousness of the elements of the claims of the present invention. Contrary to the Examiner's position that the Appellants had attacked the references individually, Appellants merely discussed each of the cited prior art and provided persuasive arguments as to why all of the elements of each of the claims of the present invention was not made obvious when the prior art references are viewed as a whole. The Examiner failed to provide a *prima facia* case of obviousness because the Examiner failed to prove that the prior art references teach all of the claim limitations, as detailed in the Appeal Brief.

Secondly, the Examiner provided no evidence or arguments as to the suggestions or motivation that one of ordinary skill in the art would find to modify the cited references to combine the references' teaching. Additionally, the Examiner clearly failed to provide any evidence or arguments as to any type of reasonable expectation of success. Reasonable expectation is required to be found in the prior art and must not based on Appellant's disclosure. The Examiner used improper hindsight reasoning to pick and choose various portions of cited prior art in an attempt to argue obviousness of all of the claims of the present invention. ***Ritzdorf*** merely relates to a metrology system that can perform feedback or feed forward uniformity and

use thickness data to drive a process recipe relating to electroplating reactors. ***Ritzdorf*** does not disclose averaging the thickness from a plurality of cites on a copper layer. ***Ueno*** does not disclose any subject matter relating to a specific quantity of stress in a copper layer would be important, contrary to the Examiner's assertion. ***Breiner*** does not refer to averaging a plurality of thickness from a plurality of locations on a copper layer, contrary to the Examiner's assertions. Therefore, even when improperly combining ***Ritzdorf***, ***Ueno*** and ***Breiner***, all of the claims 1, 7-12, and 22 of the present invention are not made obvious.

In the Examiner's Answer (*see* page 16), the Examiner asserted that the Appellants had argued that ***Ueno*** does not modify a parameter by measuring stress, but the claims do not call for this limitation. However, the point the Appellants make is that ***Ueno*** does not provide analyzing any type of mechanical stress; therefore, it would be impossible for ***Ueno*** to make obvious the usage of the mechanical stress, as called for by claims of the present invention. The claims call for varying a parameter in response to the actual thickness differing from the desired thickness and mechanical stress, which is an analysis which is clearly not made obvious by any other cited prior art. Throughout the Appeal Brief, Appellants have provided arguments as to why the prior art references taken as a whole do not teach or make obvious all of the limitations of the claimed invention. In order to explain why this is true, Appellants have discussed aspects of each of the prior art; however, when combined, the combined disclosure of the prior art references clearly does not make obvious all of the elements of the claims of the present invention.

Contrary to the Examiner's position, the claims do indeed recite mechanical stress. The claims clearly recite varying the parameter based on the measured thickness differing from the actual thickness and the mechanical stress. In other words, factors such as the variation between

the measured and actual thickness, as well as the mechanical stress are used to vary a parameter, which is a concept that is clearly not disclosed or made obvious by ***Ueno***, ***Ritzdorf*** and/or ***Breiner.***

On page 18 of the Examiner's Answer, the Examiner alleges that the wafer map allegedly refers to the reference to electrical testing. However, the Examiner merely asserts that ***Breiner*** discloses terms that support Examiner's position, such as data not being limited to wafer, which allegedly discloses that data collected from processing tools may be more extensive. Further the Examiner asserts that ***Breiner*** discloses other terms such as "including but not limited to data conditioning," "data relating to conditions of the semiconductor substrates is processed under...", to support the Examiner's argument. However, it is clear that the wafer map of ***Breiner*** does not refer to multiple data locations. The term "E value" is in the context of the phrase "multiple measurements for each data point", which suggests a mean or median value for each data point and not to the same measurements of different data points. *See* column 4, lines 61-65 of ***Breiner***. ***Breiner*** clearly separates the discussion of "wafer map" from the thickness disclosures. ***Breiner*** merely discloses the wafer map in context of electrical testing and refers to characteristics, such as breakdown voltage, leakage current resistivity, etc. The wafer map of ***Breiner*** is related to the electrical responses relating to the geography of the wafer map but not to any wafer map issues relating to the thickness. The Examiner provides no evidence or arguments as to why the average in the thickness term would be made obvious by this disclosure of wafer map and electrical characteristics. Therefore, the wafer map reference in ***Breiner*** does not provide disclosure to support the obviousness argument as used by the Examiner.

The Examiner again asserts that ***Ritzdorf*** discloses averaging thickness from a plurality of sites on a copper layer. None of the cited prior art references disclose or make obvious measuring a mechanical stress relating to a first copper layer and varying the parameter in response to the actual thickness differing from the desired thickness and the mechanical stress. ***Ritzdorf*** merely discloses that a metrology system can feed forward or feedback uniformity and thickness data to drive a process recipe. However, ***Ritzdorf*** clearly does not disclose forming an opening upon a first dielectric layer that is formed above a structure upon which copper layers form and controlling the parameter based upon the measured thickness. ***Ritzdorf*** clearly does not disclose averaging the thickness from a plurality of cites on a copper layer, therefore, the thickness, as called for by claims of the present invention and the usage of the thickness as used by the claims, is not made obvious by the prior art references.

Regarding the "B" arguments discussed in the Examiner Answer, the Examiner has mistakenly construed the disclosure of ***Jun*** to allege that the averaging of the plurality of thickness from the plurality of locations on the copper layer term is made obvious. The mere feedback disclosure of actual thickness in ***Jun***, in combination with other prior art references, does not make obvious that subject matter of the averaging of the plurality of thickness from a plurality of location of the copper layer, as called for by claims of the present invention. ***Jun*** merely discloses measurement of wafers that are analyzed for thickness at various zones. However, no disclosure as to having a plurality of thicknesses is disclosed or made obvious by ***Jun*** or any combination of the cited prior art references cited in the Office Actions. Therefore, the combination of ***Ritzdorf, Ueno*** and ***Jun,*** does not make obvious all of the elements of any of the claims of the present invention. Therefore, Appellants respectfully assert that the Examiner's rejections be overturned in light of the arguments provided in the Appeal Brief, the Reply Brief

filed September 8, 2005, and the present Reply Brief to Examiner's Answer. In light of the arguments presented above, a Notice of Allowance is respectfully solicited.

Respectfully submitted,

WILLIAMS, MORGAN & AMERSON, P.C.
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Date: June 28, 2006

By: _____

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